ANODYNE ELECTRONICS MANUFACTURING CORP.

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All references to NAT product part numbers (and associated images) are equivalent to AEM product part numbers.

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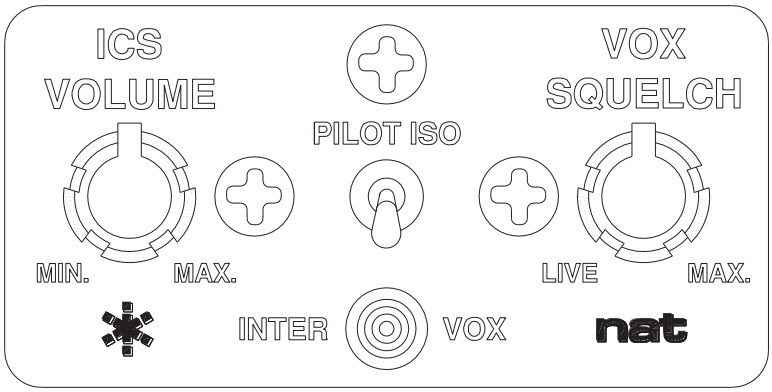
SM08

AA80 InterVOX
Intercom Systems



INSTALLATION AND OPERATION MANUAL

REV 5.00 April 30, 2012

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The status of this installation and operation manual is controlled by the revision shown on the title page. The status of each section is controlled by revision shown in the footer of each page. All revisions affecting sections of this manual have been incorporated.

AEM MANUAL REVISIONS

Section	Revision Number	Revision Description	Date
All	Rev: 5.00	Updated template	Apr 30, 2012

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Section 1.0 Description

1.1 Introduction

The AA80 InterVOX is an advanced cockpit intercom system for general aviation flying. Built to the same exacting standards as AEM's widely accepted AA9x/AMS series of audio controllers, the AA80 offers exceptional quality and performance at an attractive price. Since the InterVOX has more than three times the output power of current Sigtronics SPA400 or David Clark Isocom systems, as well as many more pilot convenience features, substantial operational improvements can be made using the AA80 over other systems.

1.2 Purpose of Equipment

The InterVOX provides full boom-mic transmit and ICS operation for the pilot, co-copilot, and 2 or 4 additional passengers, as well as offering a stereo tape input (AA80-001 only) muted during transmit and ICS operations, and pilot privacy function. Transparent ICS (a standard feature on all AEM systems) allows immediate transmission from the ICS mode without any additional switching. All the features of the AA80 have been geared to reduce the pilot's workload while providing the best possible operating features in flight.

1.3 Design Features

The InterVOX system employs AEM's unique audio processing system of dynamic noise reduction, and selective bandwidth to produce clean, crisp intercom audio under difficult and noisy conditions. This results in better on-board communication and greatly reduced pilot noise fatigue. The high output power and low distortion of the AA80 ensure adequate level for all types of headsets and flying conditions. Split bus operation AND AUTOMATIC EMERGENCY SWITCHING (back to the regular aircraft system) during power failure are standard features. The AA80 has internal overvoltage (>33V) and reverse voltage protection.

Unlike many systems targeted at light aircraft, the InterVOX uses extremely high quality components, including sealed gold contact switches; dry nitrogen filled, high vibration rated sealed relays; gold contact connectors; and a fully masked, post coated G10 flame retardant circuit board. Each unit is fully temperature cycled and life-tested.

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1.4 Feature and Specification Summary

Input Power:	11-32 Vdc. Typical current 180mA (full o/p) 250mA maximum. May be battery operated.	
Headset Power:	Typical 80 mW into each headset (150 Ohm David Clark Headset, or similar). 4 headsets total, each with short-circuit protection. Total output power 320 mW typical. 60 mW typical with 6 headsets total.	
VOX Operation:	Voice band trigger circuit with adjustable threshold on front panel. “Live” or hot mic operation by rotating VOX control to extreme counter-clockwise position.	
Indicators:	Two-color LED indicates:	TX – Green RX (SQ) – Orange
Mounting:	Vertical or Horizontal through-panel, or standard clock hole. All plates included. Optional mounting plate for standard instrument hole.	
Controls:	Front Panel:	ICS Volume VOX Threshold
	Internal:	Sidetone (artificial) RX Volume Music Level ATC Muting
Modes:	InterVOX	All hear the same audio an ICS.
	Pilot Isolation	Pilot connected directly to the radios, passengers remain on the ICS and music bus.
	Emergency	Loss of power puts pilot directly on radio bus.

Inputs:

AA80-001:
4 standard “carbon equivalent” microphones, 250 mVrms for full output, 600 ohm input impedance.
2 Music inputs (1K input impedance) 2.5 Vrms
1 Radio input (1K input impedance) 2.5 Vrms

AA80-020:
4 standard “carbon equivalent” microphones, 250 mVrms for full output, 600 ohm input impedance.
1 Music input (1K input impedance) 2.5 Vrms
1 Radio input (1K input impedance) 2.5 Vrms
1 ICS Key input (ground seeking)
1 ICS Tie Line (for IC expansion)

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AA80-060:
6 standard “carbon equivalent” microphones, 250 mVrms for full output, 600 ohm input impedance.
2 Music inputs (1K input impedance) 2.5 Vrms
1 Radio input (1K input impedance) 2.5 Vrms

AA80-062:
6 standard “carbon equivalent” microphones, 250 mVrms for full output, 600 ohm input impedance.
1 Music input (1K input impedance) 2.5 Vrms
1 Radio input (1K input impedance) 2.5 Vrms
1 ICS Key input (ground seeking)
1 ICS Tie Line (for IC expansion)

Outputs: 4 or 6 standard headset outputs (150-600 Ohm)
1 transmitter output (mic/key/ground)

Logic: Pilot priority during transmit.
Music muted during transmit, ICS operations and by incoming radio audio.

Weight: 0.7 pounds.

End of Section 1.0

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Section 2.0 Installation

2.1 General

Installation information in this section consists of unpacking and inspection procedures, installation procedures, post-installation check, and installation drawings.

2.2 Unpacking and Inspection

Unpack the equipment carefully. Inspect the unit visually for damage due to shipping and report all such claims immediately to the carrier involved. Note that each unit should have the following:

- AA80 InterVOX Intercom System
- Product Information Card
- Release certification

Verify that all items are present before proceeding and report any shortage immediately to your supplier.

2.2.1 Warranty

All Anodyne Electronics Manufacturing Corp. (AEM) products are warranted for 2 years. See the website www.aem-corp.com/warranty for complete details.

2.3 Installation Procedures

2.3.1 Warnings

Do not bundle any lines from this unit with transmitter coax line. Do not bundle any lines from this unit with 400 Hz synchro wiring, or AC power lines.

In all installations, use shielded cable exactly as shown, and ground as indicated. Significant problems may result from not following these guidelines.

All audio installations can be severely degraded by incorrect wiring and shielding, and may result in much higher cross-talk, hum, and ground-loop interference.

2.3.2 Cautions

Do not install an InterVOX unit without making a suitable amendment to the flight manual indicating the correct operation of the equipment, and effects on other systems.

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2.3.3 NOTES

The “Operations“ section of this manual (3.0) can be used to provide additional reference material for system users.

2.3.4 Cabling and Wiring

All unshielded wire shall be selected in accordance with the original aircraft manufacturer’s maintenance instructions or AC43.13-1B Change 1, Paragraphs 11-76 through 11-78. Wire types should be to MIL-W-22759 as specified in AC43.13-1B Change 1, Paragraphs 11-85, 11-86, and listed in Table 11-11. For shielded wire applications, use Tefzel MIL-C-27500 shielded wire with solder sleeves (for shield terminations) to make the most compact and easily terminated interconnect. Follow the wiring diagrams in **Section 2.9** as required.

Installation cabling must allow the unit to be easily withdrawn for disconnection, switch and pot settings (internal), and removal. Ensure an adequate service loop is allowed in the routing of the cable. This can become a serious problem if the unit is installed with the cables so short that the unit cannot be removed without disassembly of the mounting console. At least 1 foot (30 cm) of free cable is recommended.

Allow 3 inches (8 cm) from the end of the wire to the shield termination to allow the hood to be easily installed. Note that the hoods supplied by AEM in installation kits are 'clamshell' hoods, and are installed after the wiring is completed.

Generally, all wiring should be at least 22 AWG, except power and ground connections, which should be 20 AWG - check the appropriate Interconnect drawing for the unit under consideration. Ensure that the ground connection is clean and well secured. To prevent inadvertent system failure, power to this system must be supplied from a separate breaker or fuse, and not bundled to any other source. A ½ A breaker is suggested (28 Vdc source).

2.3.5 Mechanical Mounting

If the InterVOX will be installed in a standard clock hole, no holes need to be drilled, as the unit will mount directly into the existing hole pattern. If horizontal or vertical mounting with a rectangular faceplate is desired, check the drilling template in **figure 2.41.** Note that the mounting nuts for the panel pots ARE NOT REMOVED AT ANY TIME. Clearance hole should be drilled (3/8”), so that they will fit into the instrument panel. The AA80 can be mounted in a standard instrument hole by using the AA80-SQR adapter plate.

The template can be fastened directly to the instrument panel, and the holes drilled through the indicated locations. An Allen key is required to remove the knobs from the pots prior to mounting. The unit is held in place with three black Phillips screws (supplied), which require 5/32” panel holes.

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2.3.6 Post Installation Checks

Before the unit is permanently mounted, perform the following functional tests and make any needed adjustments and switch or jumper settings. Ensure that the unit is securely mounted before any flight is attempted.

2.3.6.1 Voltage/Resistance Checks

Do not attach the InterVOX Intercom System until the following conditions are met.

With the InterVOX disconnected from its mating connector, make the following measurements on the mating connector:

a) Check pin **<1>** for +28 Vdc relative to ground.

b) Check pin **<14>** for continuity to ground (below 0.5 ohms).

2.3.6.2 Power On Checks

WARNING:
High volume settings can cause hearing damage.
Set the headset volume control to the minimum volume setting prior to conducting this test and slowly increase the headset volume level to a comfortable listening level.

Power up the aircraft's systems with the InterVOX installed and turn on all of the radios and other accessories required for this system. Be sure that headsets of good quality are installed correctly in the aircraft, and begin with ONLY the PILOT's headset installed, no hand mic.

Check for correct radio operation, both receive and transmit, any yoke/cyclic switch action. Do not proceed until the radios are operating correctly. You may have to set the SIDETONE pot on the side of the AA80, or internally in the radio to achieve the correct balance desired by the pilot. Note that the SIDETONE pot adjusts the level of artificial, internally generated, sidetone created in the AA80.

You should adjust the RX (RECEIVE) pot for the same audio level when in either the InterVOX or PILOT ISOLATION mode. A balance should be made between the actual radio levels and the RX pot so that emergency or isolation levels are satisfactory for the pilot. Note that the front panel level control adjusts ICS level only.

If you have a music source (tape player, etc.), adjust the MUSIC pot for suitable level through the InterVOX input. Note that this signal will be muted during ICS operations, and during the reception of incoming radio signals.

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Unusual buzzes, hums or other background audio are symptomatic of multiple grounds, or noisy external systems such as blowers or pumps sharing wiring with the audio system. Failure to key or correctly modulate a transmitter is often caused by forgetting to connect all required grounds to the radio or external audio system. A special caution is that no ground should be taken from the front panel or similar location that share a ground return with a turn and bank, horizon or other motor driven instrument. If this caution is not observed, the sound of the motor may be heard in the InterVOX unit, as ground loop interference.

Plug in the hand mic, and test for correct operation in both the InterVOX and pilot isolation modes. It must activate the transmitter(s) in all cases. If the emergency jacks have also been installed, ensure they also operate correctly in all modes of operation.

Plug in any remaining headsets, and check for correct ICS operation. Note that incorrect jack wiring is a common fault for rear passenger stations, and may cause a wide range of problems from loss of audio to a tone on the headset lines.

Fly the aircraft, and check levels and operation of all functions. With VOX triggered ICS, set the threshold for reliable triggering while in FLIGHT, and use the LIVE position when idling or on the ground. This will prove to be the most practical and reliable system set-up.

Before leaving the aircraft, ensure that THE MATING CONNECTOR IS SECURLY FASTENED TO THE AA80 WITH ITS ANCHOR SCREWS. Also ensure that the unit is securely fastened to the aircraft from the front panel.

If all functions are satisfactory, the aircraft may be released for service once all required log entries are made, and the required MOT/FAA paperwork is completed.

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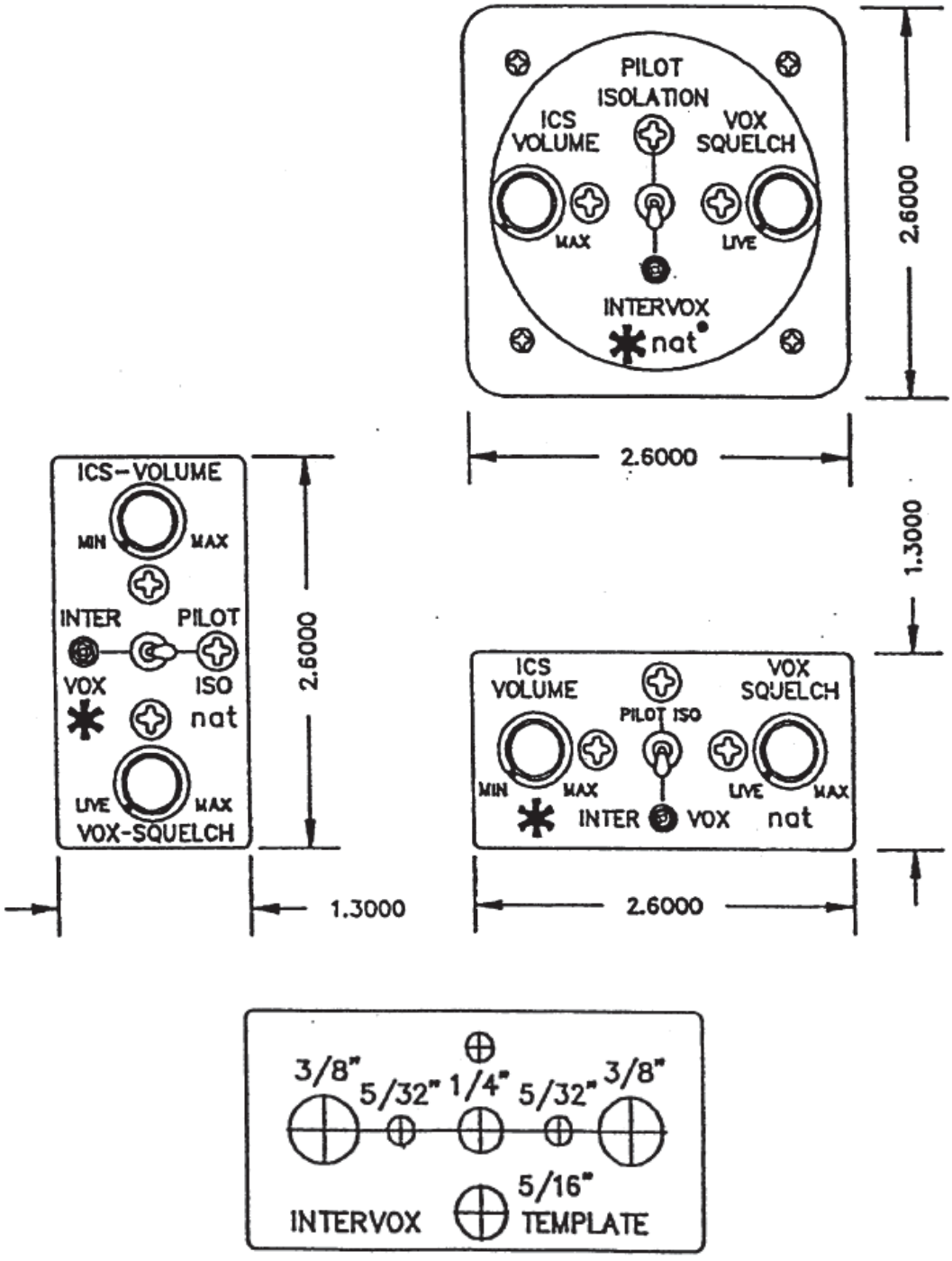
2.4 Installation Drawings

2.4.1 Mechanical Outline and Drilling Template



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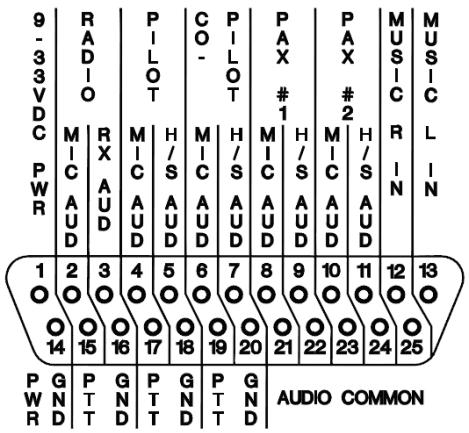
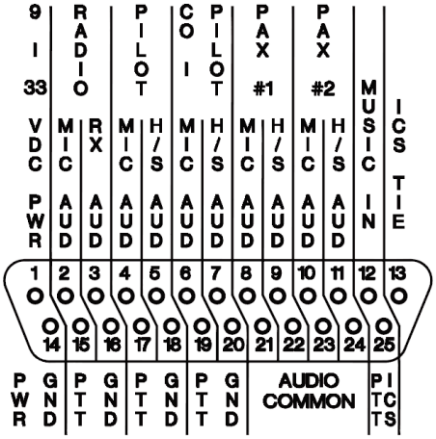
2.4.2 Connector Maps

Note: Shown from the solder side of the mating connector.

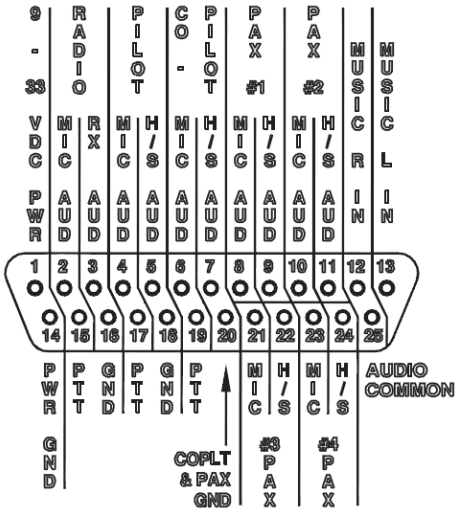
AA80-001 Version



AA80-020 Version

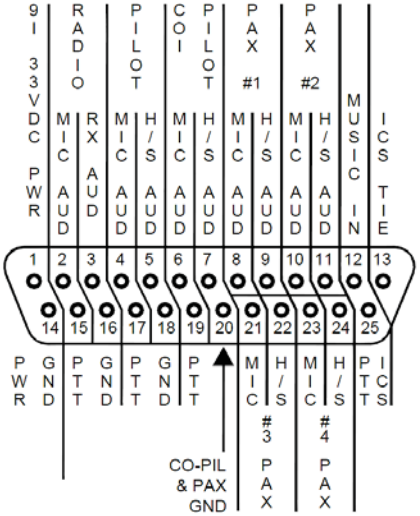


AA80-060 Version



CAUTION DO NOT USE IN SAME HARNESS AS -001 OR -020

AA80-062 Version



CAUTION DO NOT USE IN SAME HARNESS AS -001 OR -020

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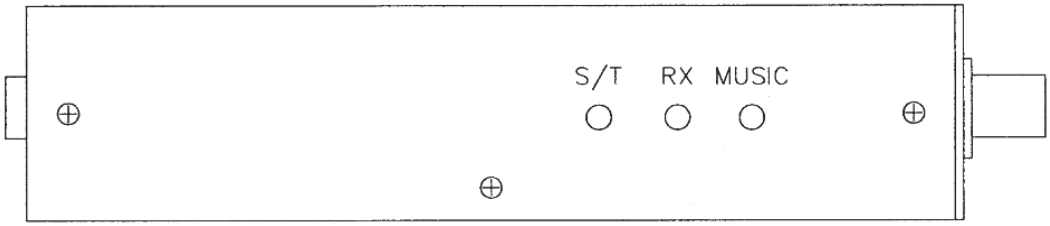
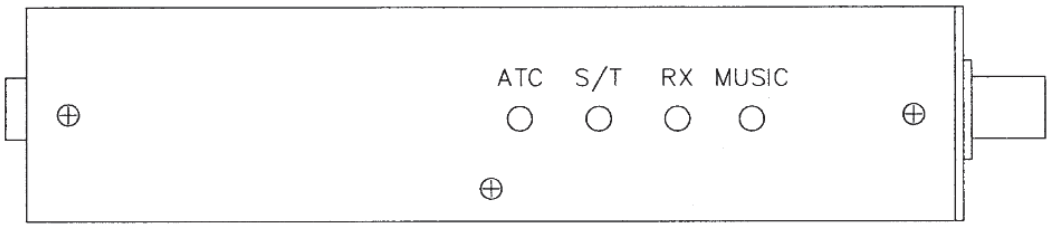
2.4.3 Adjustment Locations

Up to serial number 2999



Serial Number 3000 and subsequent



Notes:
S/T adjusts level of INTERNALLY GENERATED SIDETONE (if not produced by existing radios).

RX adjusts level of RECEIVE AUDIO from existing radio equipment. Should be balanced for adequate level in both InterVOX and Pilot Isolation (emergency) modes.

MUSIC adjusts level of EXTERNAL MUSIC SOURCE (tape player or other).

ATC adjusts the trigger point for the music muting from an incoming radio source (ATC transmissions).

Use a small straight blade screwdriver, or potentiometer tool to make these adjustments, and do not exert excessive force.

Only the ICS level is adjustable from the front. All other levels are preset via these pots.

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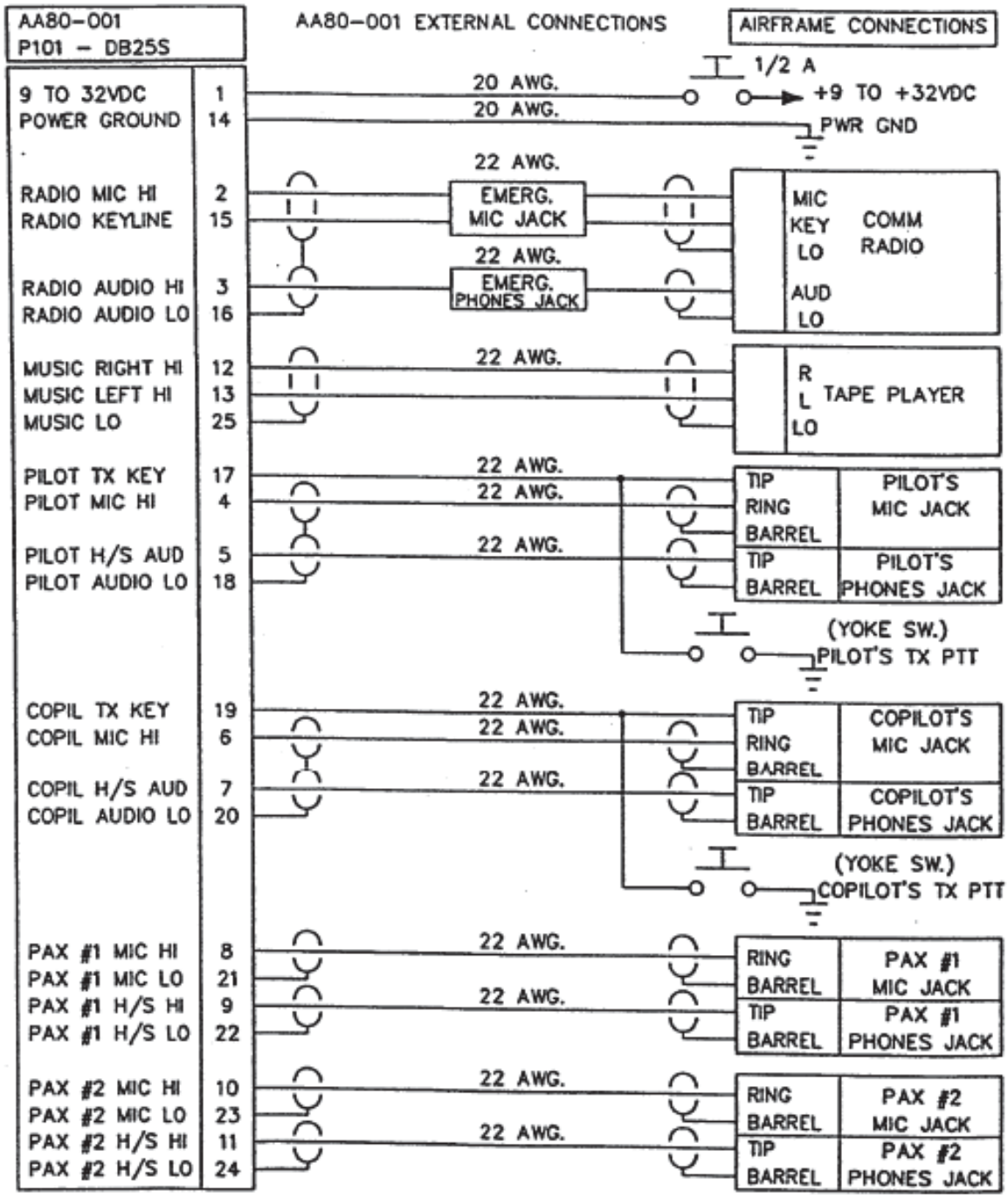
2.4.4 Interconnect Wiring Diagram (VOX only -001 Version)



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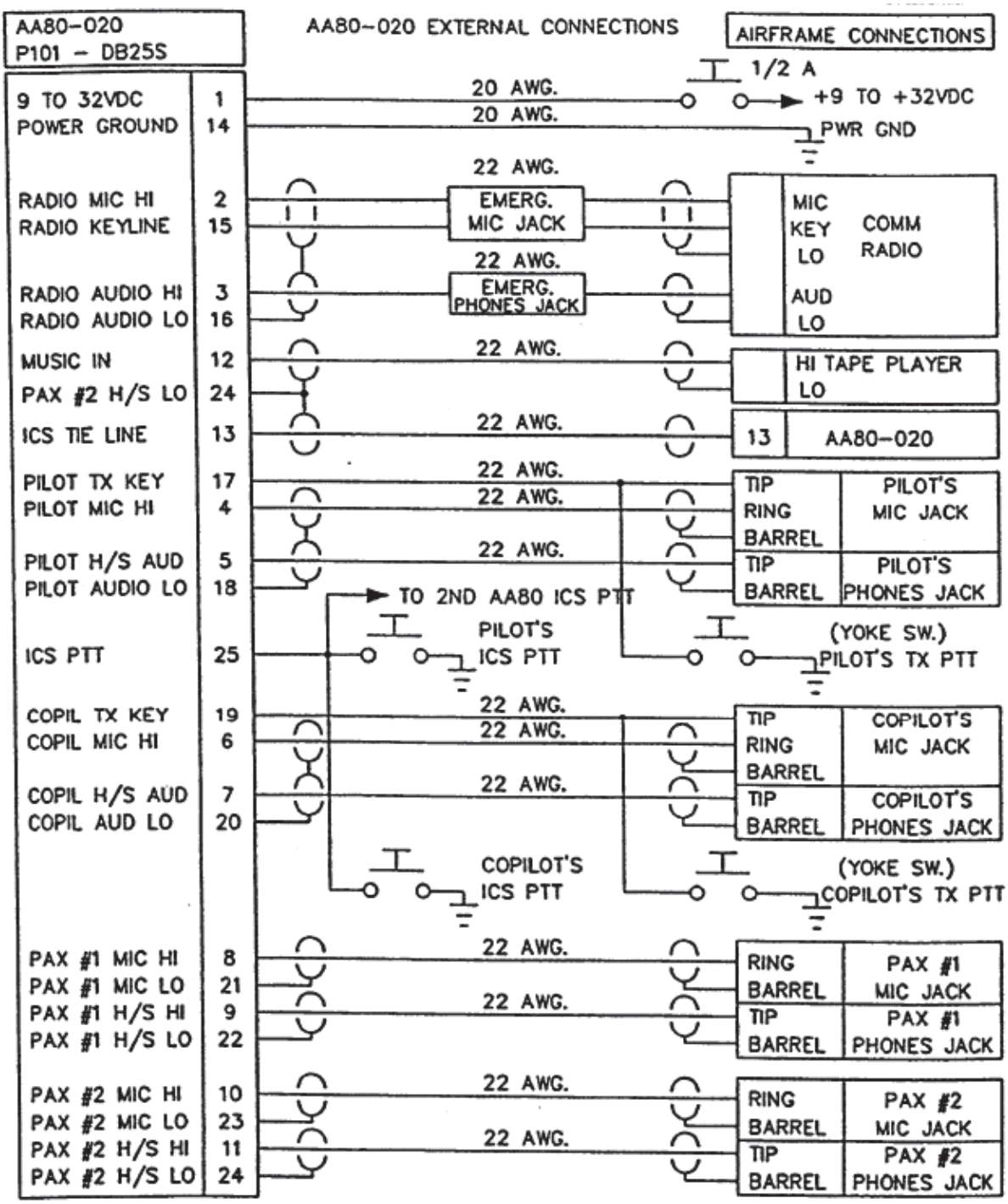
2.4.5 Interconnect Wiring Diagram (PTT ICS & VOX -020 Version)



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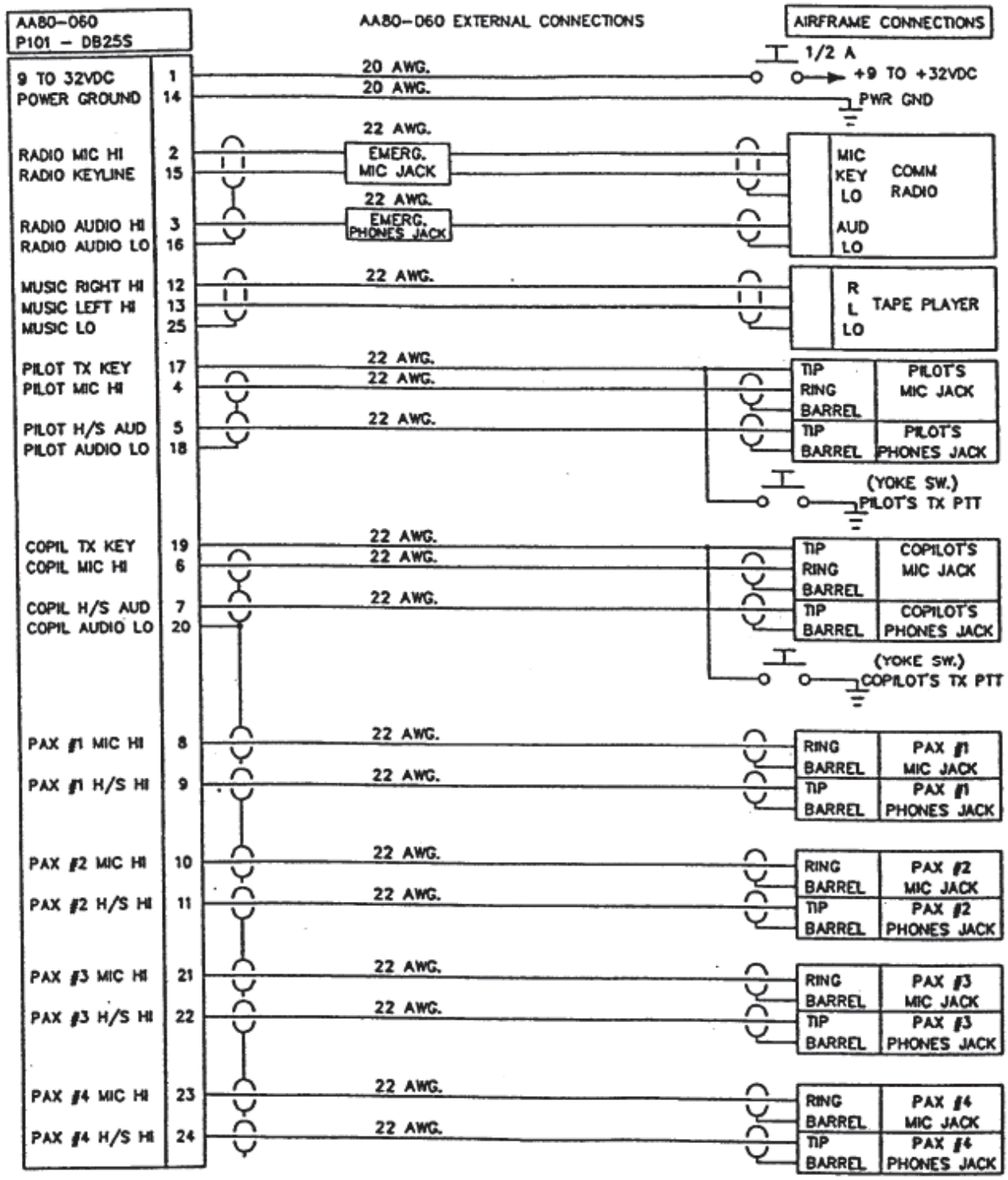
2.4.6 Interconnect Wiring Diagram (VOX only -060 Version)



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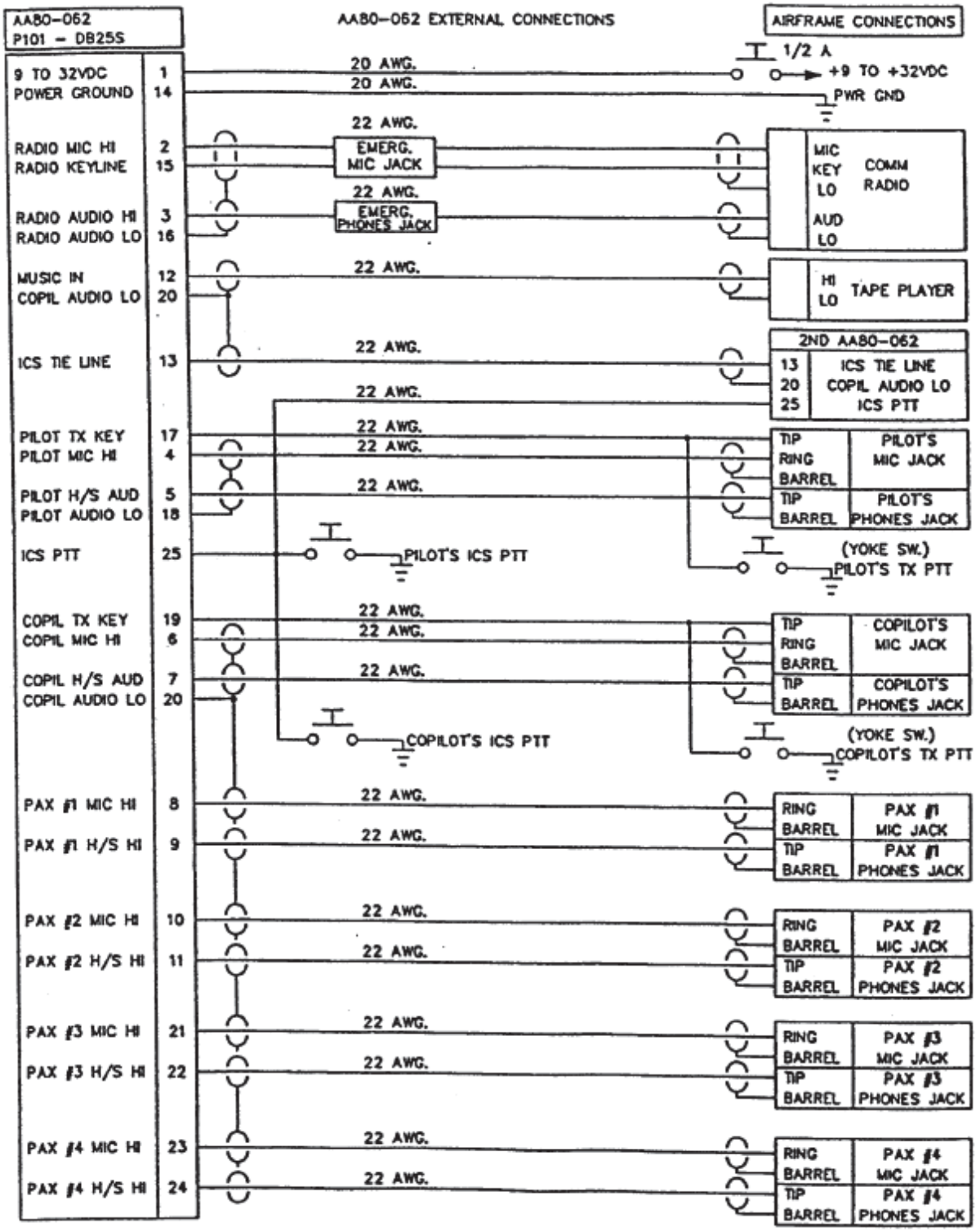
2.4.7 Interconnect Wiring Diagram (PTT ICS & VOX -062 Version)



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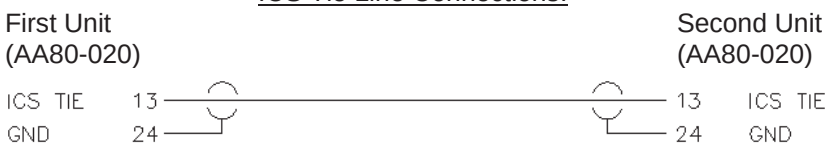
2.5 Installation Notes

1. The -001 and -020 versions are plug compatible only if no connections have been made to pins 12, 13, and 25. These units should not normally be interchanged in a given aircraft, or ICS and music problems will occur.

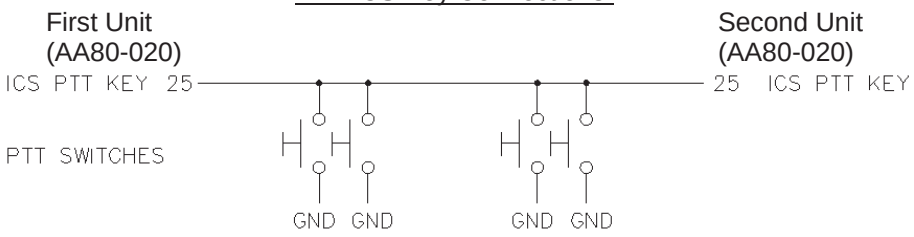
2. The -001 and -060 versions support only VOX or Live ICS, and no provision is made for connecting multiple units together. The -020 and -062 versions have an ICS Tie Line for multiple unit connections, and also provides an ICS key line input to support PTT ICS operations.

ICS Tie Line Connections:



This will result in common ICS audio between both units. The bus may be ‘split‘ into two loops, or ‘tied‘ together if this line is opened and closed with an external switch. Use shielded cable as shown. This is applicable to -020 and -062 units only.

PTT ICS Key Connections:



The IC PTT lines must be tied together between both units, or keying one unit will fail to open the ICS gate in the second unit. Note that for best PTT operation, the VOX squelch pot on the front panel should be rotated to its most clock-wise position (fully squelched off). Ground switches to the same airframe return used for the AA80. This is applicable to -020 and -062 units only.

3. The ICS tie line on the -020/-062 can be connected to either another AA80 or to an AEM audio controller with ICS tie capability. This allows several possibilities for ICS expansion, depending on customer requirements. Note that the absolute ICS level will drop slightly when a connection is made to the ICS tie line.

4. The ICS key input must go directly to ground (the same ground point used by the AA80), with no external diodes or other voltage drops, to ensure correct keying operation. To use the keying function, rotate the SQUELCH control fully clock-wise (so that no ICS audio is heard). Closing the ICS key line will then open the squelch, and allow ICS audio to be heard. If the ICS PTT Key lines are not connected together between units, activating the PTT line will only open the ICS gate in the unit to which it is connected, and there will be no common ICS audio between units.

5. When using two AA80 units tied together, each AA80 unit will have independant squelch and level adjustments. Note, however, that the incoming ICS audio from another AA80 must be of sufficient level to trip the squelch setting on the other unit in use. Some mutual adjustment of squelch controls will be needed to ensure smooth operation under all conditions.

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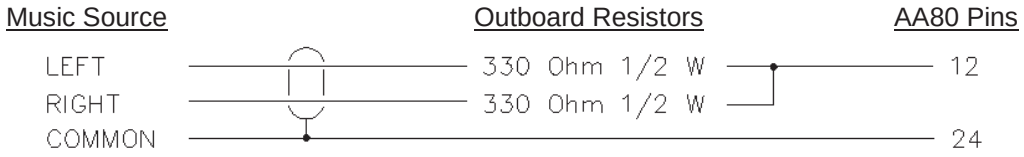
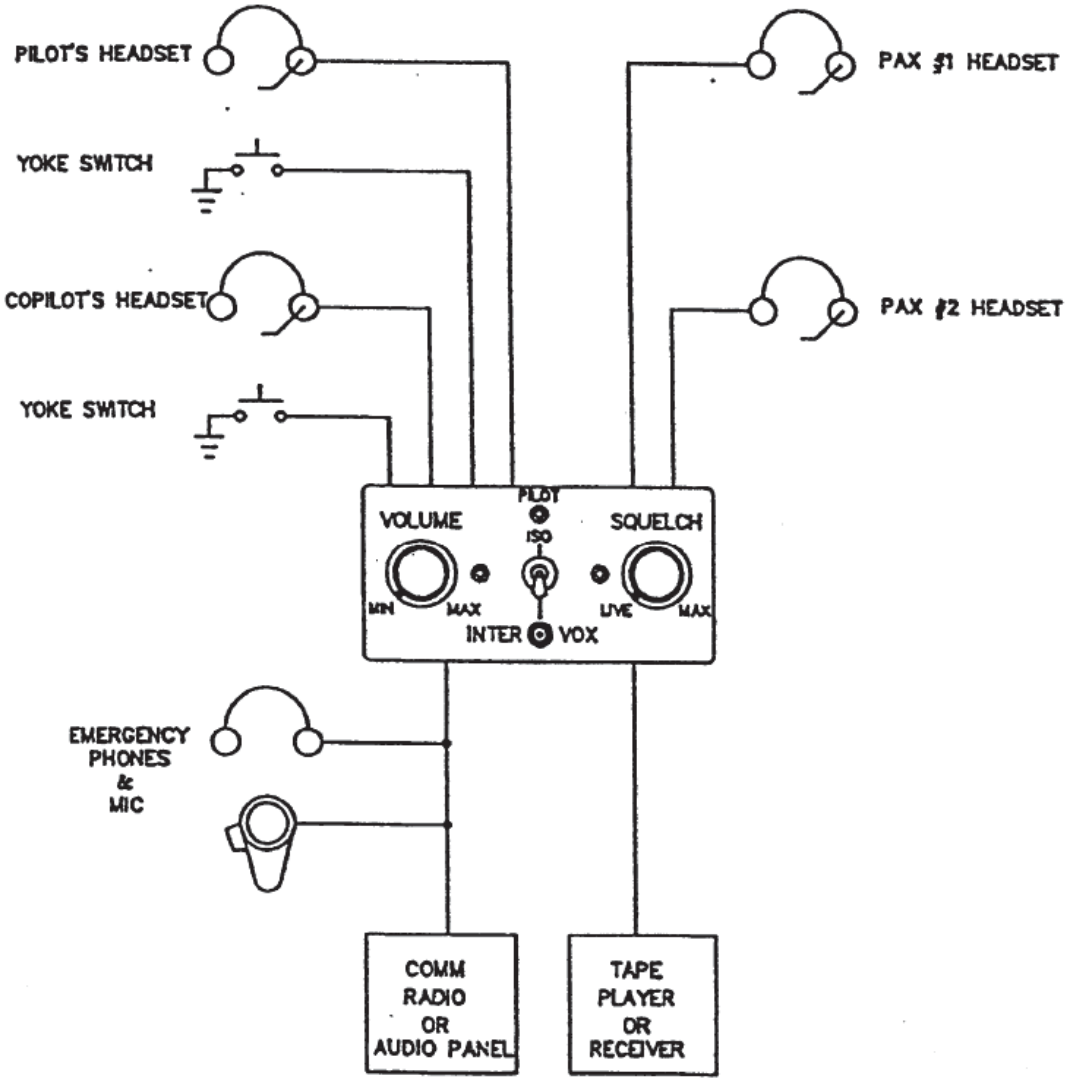
6. If a stereo music source is used with the AA80-020/-062 it can be interfaced to the single pin input (pin 12) in the following way. Note that this assumes that the low or common sides of the audio from the music source are grounded together, and are NOT BRIDGE TYPE outputs.



This will produce a composite mono music source for use in the AA80-020/-062. In the AA80-001/-060 this connection is made internally, so no outboard components are needed.

2.5.1 System Block Diagram: AA80-001 Version



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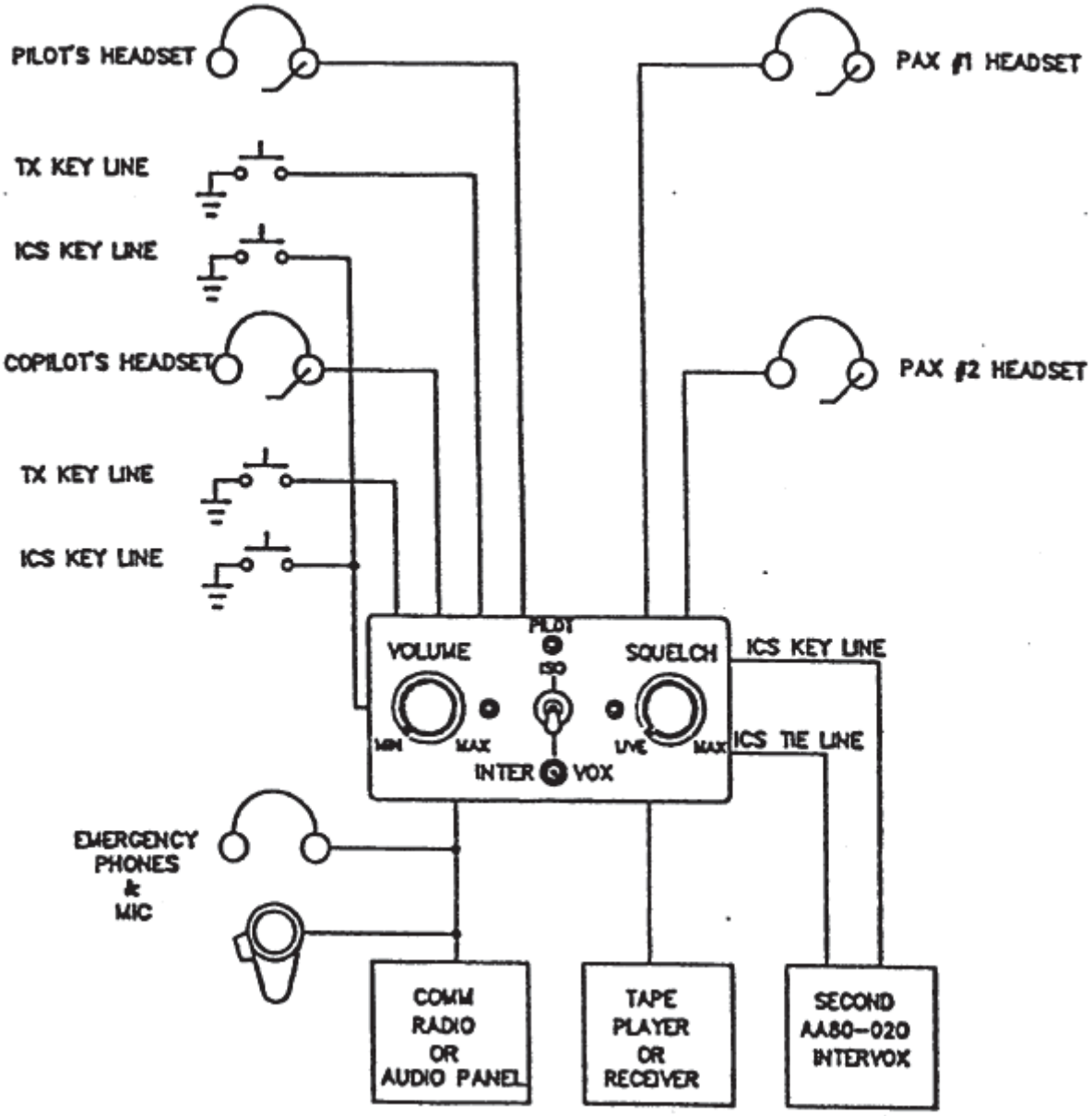
2.5.2 System Block Diagram: AA80-020 Version



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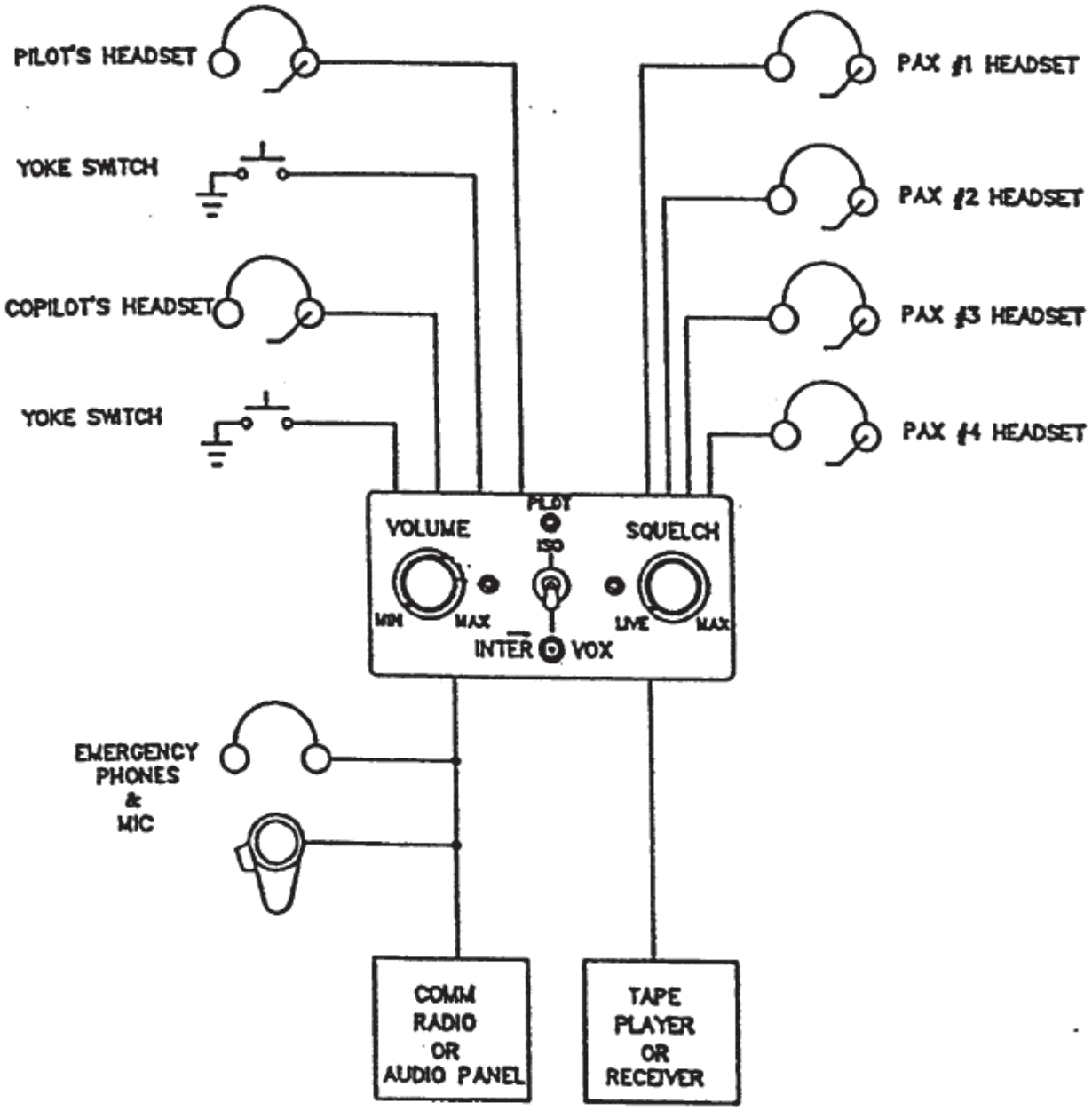
2.5.3 System Block Diagram: AA80-060 Version



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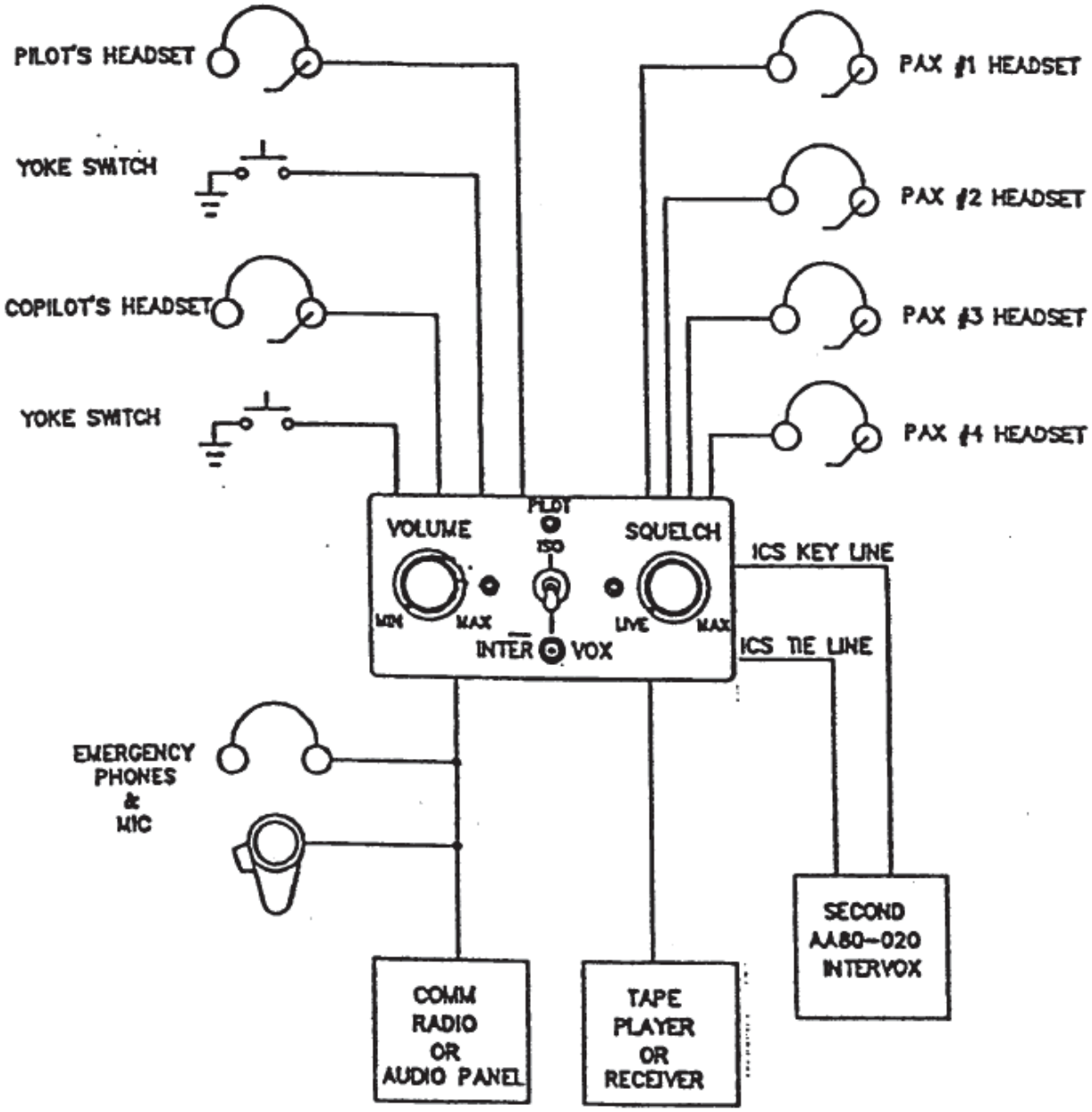
2.5.4 System Block Diagram: AA80-062 Version



End of Section 2.0

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Section 3.0 Operation

3.1 Limitations

The AA80 intercom system imposes no limitation on the original airframe.

3.2 General

The AA80 intercom system provides one central control for all the aircraft audio, allowing existing radio and entertainment audio to be mixed with live or voice activated intercom audio. Boom microphone control is also provided for two places (pilot & co-pilot), with pilot priority, and muting of the entertainment audio is provided during ICS (Intercom) or TX (transmit) operation. An emergency/isolation mode is also provided for the pilot.

Control over radio receive level (internal), transmit sidetone level (internal), music level (internal), intercom level (front panel), and VOX threshold (front panel) is provided. The VOX threshold or squelch also allows for a “live” mode, by defeating the squelch, and allowing continuous ICS operation. Units of serial number 3000 and higher also feature an ATC muting adjustment (internal).

Operation of the ICS is transparent, allowing transmit during any ICS mode simply by use of the TX PTT switch.

3.3 Selection of Transmit Functions

Keying the external TX PTT switch activates the AA80 for transmit, with the pilot’s switch having priority in normal or “INTERVOX” mode. Proper TX operation is annunciated by a green light on the front of the AA80.

Sidetone is normally heard from the radio(s) connected to the AA80, but if not available, an internal pot will adjust the level of artificial sidetone generated within the AA80 system for the pilot’s convenience. Note that this artificial sidetone is only available through the amplifier in the AA80, and will be lost to the pilot in the “PILOT ISOLATION” mode, and be heard by the passengers.

3.4 Selection of Receive Functions

Receive audio is always enabled through the eAA80, and has a separate internal adjustment to allow balancing of this level to suit the pilot’s preference, and equalize iso/normal operation.

An additional input is provided for entertainment audio (tape, etc.), with a separate level adjustment. This line is muted during transmit functions, when the intercom is active, and during reception of radio signals.

IF the “ISO” function is selected, the pilot will be connected directly to the radios, while the co-pilot and rear passengers remain on the ICS bus with the entertainment audio. In the “INTERVOX” mode, all stations hear the same audio.

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3.5 ICS Functions

AA80-001 and AA80-060

Intercom audio may be generated in two modes between users, “LIVE” (on constantly), or “VOX” (voice activated). This is selected, along with the squelch threshold of the VOX circuit, by the “VOX SQUELCH” control on the front of the AA80. When the VOX trigger is activated, the front panel indicator will light up amber, indicating that the ICS system is ON.

AA80-020 and AA80-062

Intercom audio may be generated in three modes between users; “LIVE” (on constantly), “VOX (voice activated), or PTT (push-to-talk). This is selected, along with the squelch threshold of the VOX circuit, by the “VOX SQUELCH” control on the front of the AA80. When the VOX trigger is activated, the front panel indicator will light up amber, indicating that the ICS system is ON.

Mode of Operation	Position of VOX Control
LIVE	Fully counter-clockwise
VOX	Mid-position (typical)
PTT	Fully clockwise

Intercom level or volume is set by the “ICS VOLUME” control on the front of the AA80. It does not affect the level of other audio within the system.

ICS functions are available to all users when the system switch is in the “INTERVOX” mode. When it is in the “PILOT ISOLATION” mode, only the co-pilot and the two passengers have ICS capability.

3.6 Emergency Operation

If power is lost to the AA80 for any reason, it will drop into the power-fail mode, and the pilot will be connected directly to the radios for emergency operation. The external PTT switch will still function. This mode is similar to the “PILOT ISOLATE” mode, except that all co-pilot and passenger functions are lost, since they depend on external power. A power failure has occurred when the panel indicator fails to light under any condition.

If a catastrophic relay failure of the AA80 should occur, or the rear connector becomes loose or disengaged, the designated emergency hand mic and headset jacks will allow operation to continue, as they have no connection directly through the AA80.

The “PILOT ISOLATION” mode required no power, and will operate even if other circuitry should fail in the AA80. Note that during this mode, the co-pilot’s mic IS NOT locked out, and he could transmit, although he could not receive the incoming audio.

All aspects of emergency operation should be confirmed to be working by the pilot before accepting the aircraft into service.

End of Section 3.0

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